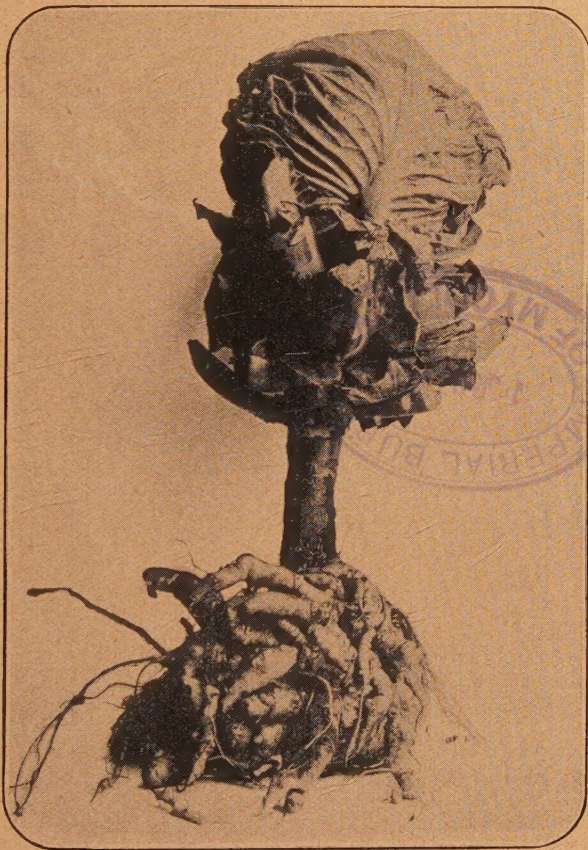


CLUB ROOT



OF CABBAGE

EXTENSION SERVICE OF THE COLLEGE OF AGRICULTURE
THE UNIVERSITY OF WISCONSIN, MADISON



Cabbage Club Root

Is a soil-borne disease.

Occurs on cabbage and related plants.

distributed by:

seedlings,
farm tools and shoes,
flood water.

Can be controlled by:

insisting on club-root-free
seedlings,
locating seed bed on soil
free from club root
germs,
following good system of
crop rotation,
applying lime to acid soils
draining wet lands.

(Upper Fig.) Flagged or Wilted Plants

(Lower Fig.) Club Root on Young Plants



Club Root of Cabbage

R. E. Vaughan and F. L. Wellman

THE DISEASE known as club root of cabbage is becoming more destructive each year in Wisconsin. It will cause serious losses in intensive cabbage growing regions unless growers take steps to control further spread. The club root disease also is increasing in Wisconsin. It is known to occur on all varieties of cabbage and related plants.

The most important factor in control is to secure seedlings free from club root infection. This can be done only by having the seed bed on clean soil. Crop rotation, lime, and drainage tend to prevent development of club root. It occurs on the cultivated crops of the cabbage and mustard family, such as cauliflower, kohlrabi, kale, rape, radishes, turnips, and on practically all the weeds in this family like the mustards, charlock, and shepherd's purse.

Swollen Roots First Symptom

Club root can be detected at transplanting time whenever the plants are badly infected. (Lower photograph on opposite page.) However, if the infection is light and the plants are handled rapidly, small swellings may escape detection. In any case, it is not commonly possible to recognize diseased seedlings in the seed bed before transplanting, without pulling and examining the roots. The first symptoms are swollen or irregularly clubbed and gall-like roots.

Cabbage plants having serious infection of club root will, by late summer or early fall, show an unusual number of markedly wilted or "flagged" plants. (Upper photograph on opposite page.) Any destruction of the root system such as maggot injury, black leg or flooding may cause a similar wilt. Pulling and examining the roots for the swellings is the only certain way of knowing whether club root is causing the trouble. After the diseased roots have been swollen for a few weeks they usually decay and partially remain in the soil when the plants are pulled.

The Cause of Club Root

The club root disease of cabbage is caused by a germ, invisible to the naked eye, which lives in the soil and attacks the roots of members of the cabbage family. This germ, upon entering any part of the root, irritates the tissue and causes it to form a swelling. Inside this the germ finds ideal conditions for growth and reproduction. Seed bodies

or spores are formed and it is at this time that the clubbed root decays and the spores are left in the soil, increased in number many thousand times.

Club root weakens the plant because of the use of the food substances by the disease germ, and because the diseased root system cannot absorb enough water and soil nutrients to feed the upper part of the plant. A wet period favors the disease. During a dry spring there may be no disease appearing in the plant bed, but in a wet summer the plants in the field may contract the disease so badly that the crop may be ruined.

How to Control Club Root

To secure club-root-free seedlings and set them in a field free from the disease is the most important thing in cabbage club root control. It is never safe to use seedlings from a seed bed or farm where club root is known to exist because the disease germs may be carried by farm machinery, horses' feet, the shoes of workmen, as well as in small clubbed roots on cabbage plants, and even with soil which may stick to apparently healthy roots on the seedlings. Fields, near those known to have the disease, may often become contaminated by the washing down of disease germs in the flood water. One seed bed may spread the disease throughout a whole neighborhood. The selection of a clean seed bed, therefore, is of the highest importance in the control of club root.

Rotation of crops is important. Fortunately, club root does not occur on corn, grain, grass, beets, potatoes, beans, and like crops, so that a wide variety of plants may be used in the rotation. The main thing is to keep away from all members of the cabbage and mustard family, including weeds as well as those plants cultivated for their flowers.

Lime applications of two and four tons to an acre serve to sweeten the soil and tend to make conditions less favorable for the club root organism. Air-slaked or hydrated lime is preferable to ground limestone since it gives more immediate and complete results. Thorough under drainage, such as may be secured from a well planned and installed system of tile, is also often helpful in club root control. Lime and drainage should be used, combined with a long rotation of crops if best results are to be assured.